OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **PLEASANT LAKE, NEW LONDON,** the program coordinators recommend the following actions. *We would like to encourage the association to conduct more deep spot sampling in the future. With a limited amount of data it is difficult to determine water quality trends. Since weather patterns and activity in the watershed can change throughout the summer it is a good idea to sample the lake several times over the course of the season.*

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *variable* in-lake chlorophyll-a trend. Algal abundance increased slightly this season and consisted of diatoms and golden-brown algae. Spring rain likely washed excess nutrients into the lake; this can lead to more algae growth. Conducting deep spot sampling more frequently will allow us to establish an accurate trend of algal abundance in the lake. Chlorophyll concentrations have remained below the New Hampshire mean reference line since Pleasant Lake joined the VLAP program. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *slight worsening* trend in lake transparency, which means clarity has decreased since 1997. June transparency results were lower as a result of the small waves noted on the Field Data Sheet, and possibly from the abundance of algae at that time. Water clarity in July and August improved, and all results were above the average for New Hampshire lakes. The 2000 sampling season was considered

to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *fairly stable* trend for in-lake phosphorus levels. Phosphorus concentrations for the upper and lower water layer improved this season. Concentrations were below the New Hampshire median reference line. Increasing the frequency of deep spot sampling in the summer months will help us to track phosphorus trends of the different layers more accurately. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- While it is commendable that you already carry out such an extensive sampling program, we suggest that you begin sampling at the deepest part of the lake at each thermal layer (epilimnion, metalimnion, and hypolimnion). This helps us to understand the overall health of the lake since all depths are represented. If you agree, it would be worthwhile to contact the VLAP Coordinator to be trained at collecting deep spot samples. In relation, we normally test only the upper layer (epilimnion) for acid neutralizing capacity (ANC), while the Pleasant Lake nearshore samples have all recently been analyzed for ANC. A sample collected in the deep spot and analyzed for ANC will be indicative of this parameter at the nearshore sites.

- Conductivity remains stable and low in the Pleasant Lake watershed (Table 6). Conductivity increases can indicate human-influenced activities, including road runoff, agricultural runoff, and septic system failures. The low values observed year after year in Pleasant Lake are a good indication of the lake's health.

- **Please note** on one occasion this summer the phosphorus level of PL3 was recorded as less than 5 µg/L (Table 8). The NHDES Laboratory Services adopted a new method of analyzing total phosphorus this year and the lowest value that can be recorded is

'less than 5 µg/L'. We would like to remind the association that a reading of 5 µg/L is considered low for New Hampshire's waters.

- Total phosphorus concentrations remained low throughout the summer at most stations (Table 8). This implies there are few external sources of phosphorus in the watershed. We would like to see this trend continue.

- Dissolved oxygen was high throughout the water column in June (Table 9). As stratified lakes age, oxygen is depleted in the lower layer by the process of decomposition. The lack of this aging indicator is a sign of the lake's overall health. Since the depletion of oxygen generally occurs in warmer waters (i.e. at the end of the summer) we suggest scheduling the annual visit by a DES biologist for July or August. Contact the VLAP Coordinator this spring at (603) 271-2658 or e-mail to vlap@des.state.nh.us.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were low at the sites tested (Table 12). If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for *E. coli* in surface waters.

NOTES

- Monitor's Note (6/20/00): No anchor, but stayed fairly stable.

- Monitor's Note (5/14/00): ¼" rain yesterday.

USEFUL RESOURCES

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

Proper Lawn Care Can Protect Waters, WD-BB-31, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

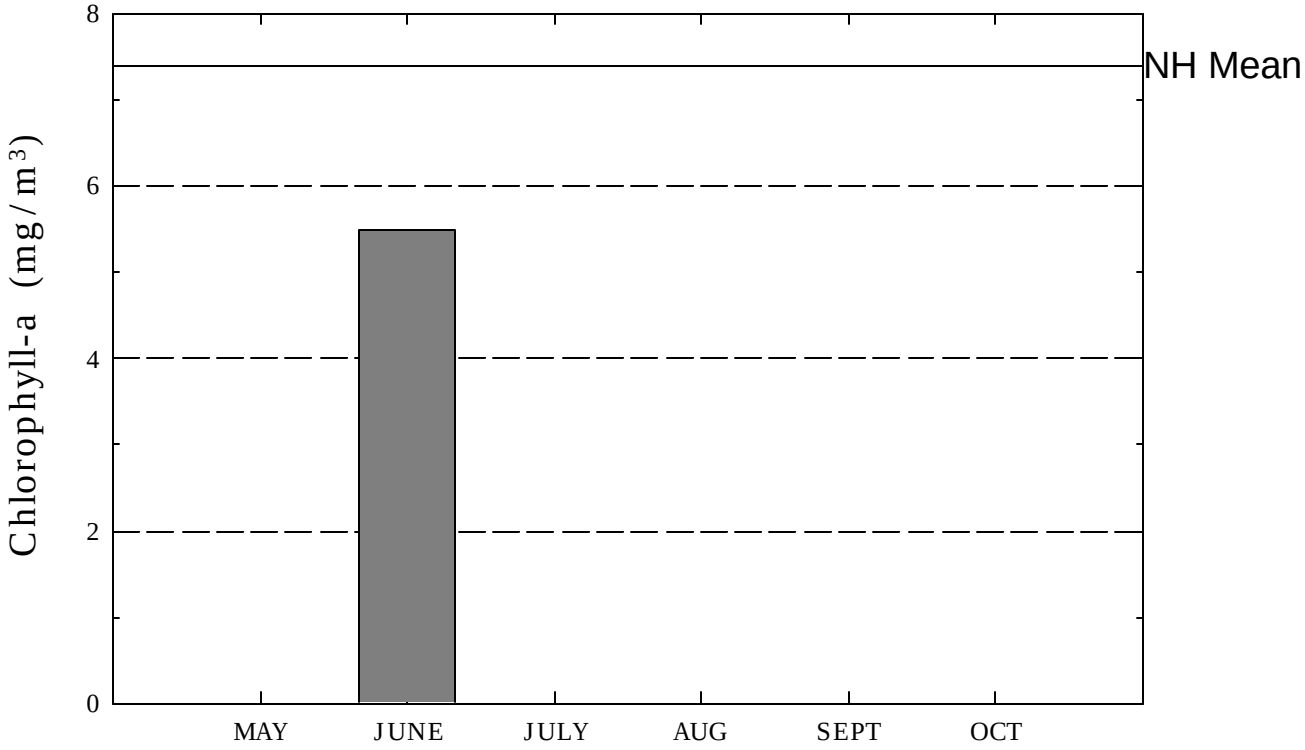
Bacteria in Surface Waters, WD-BB-14, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Septic Systems and Your Lake's Water Quality, WD-BB-11, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

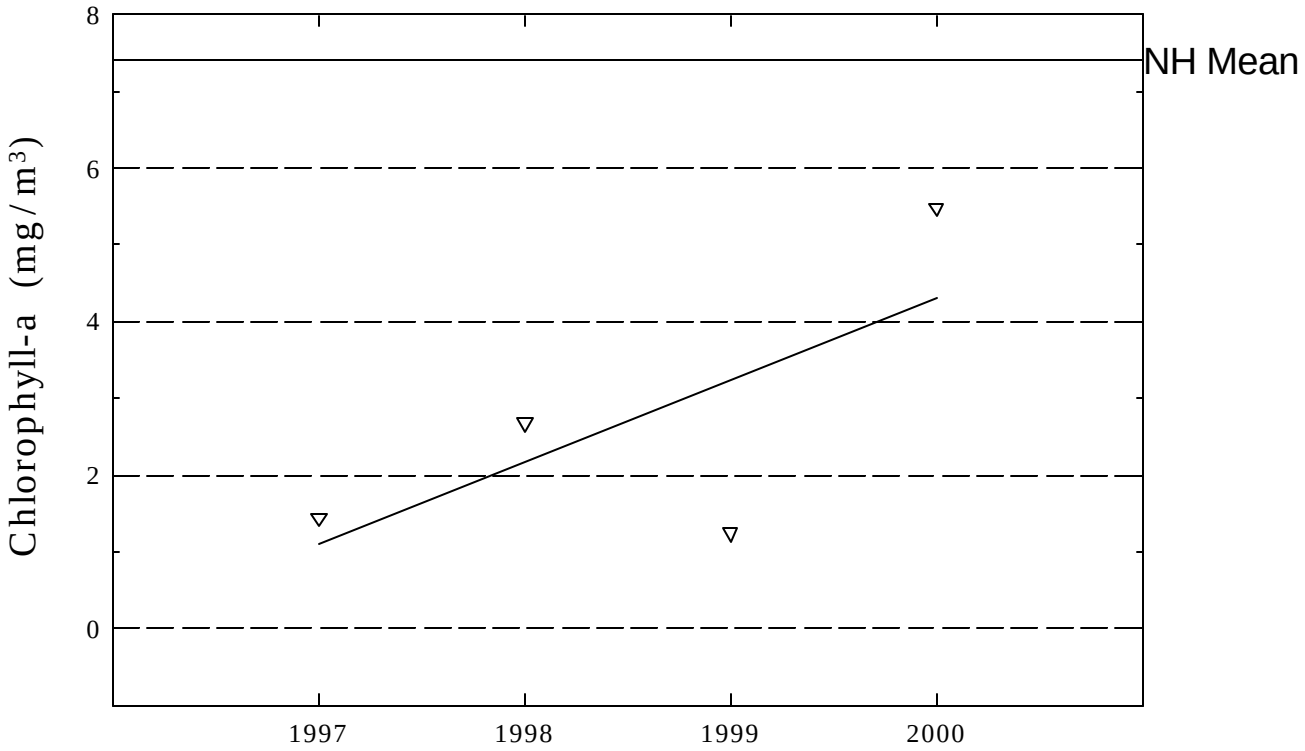
Anthropogenic Phosphorus and New Hampshire Waterbodies, NHDES-WSPCD-95-6, NHDES Booklet, (603) 271-3503

Pleasant Lake, New London

Figure 1. Monthly and Historical Chlorophyll-a Results



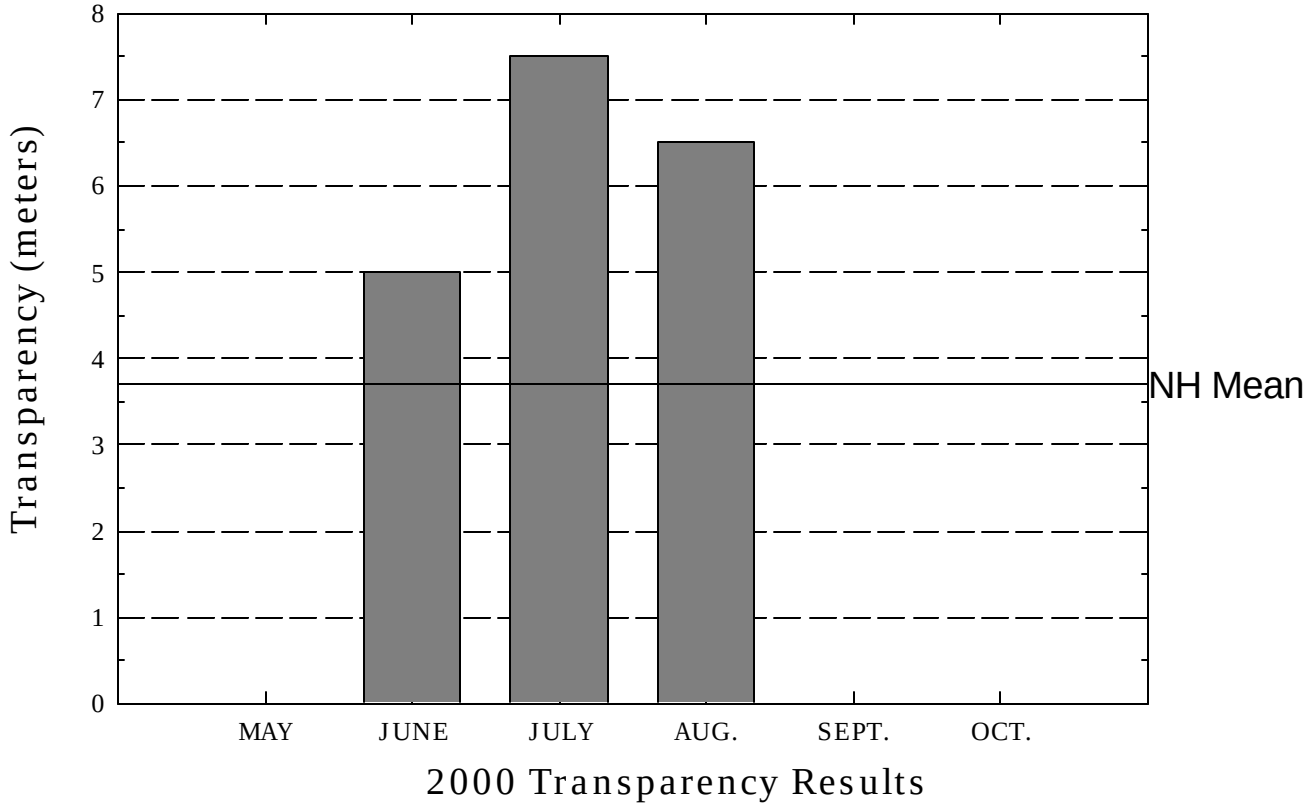
2000 Chlorophyll-a Results

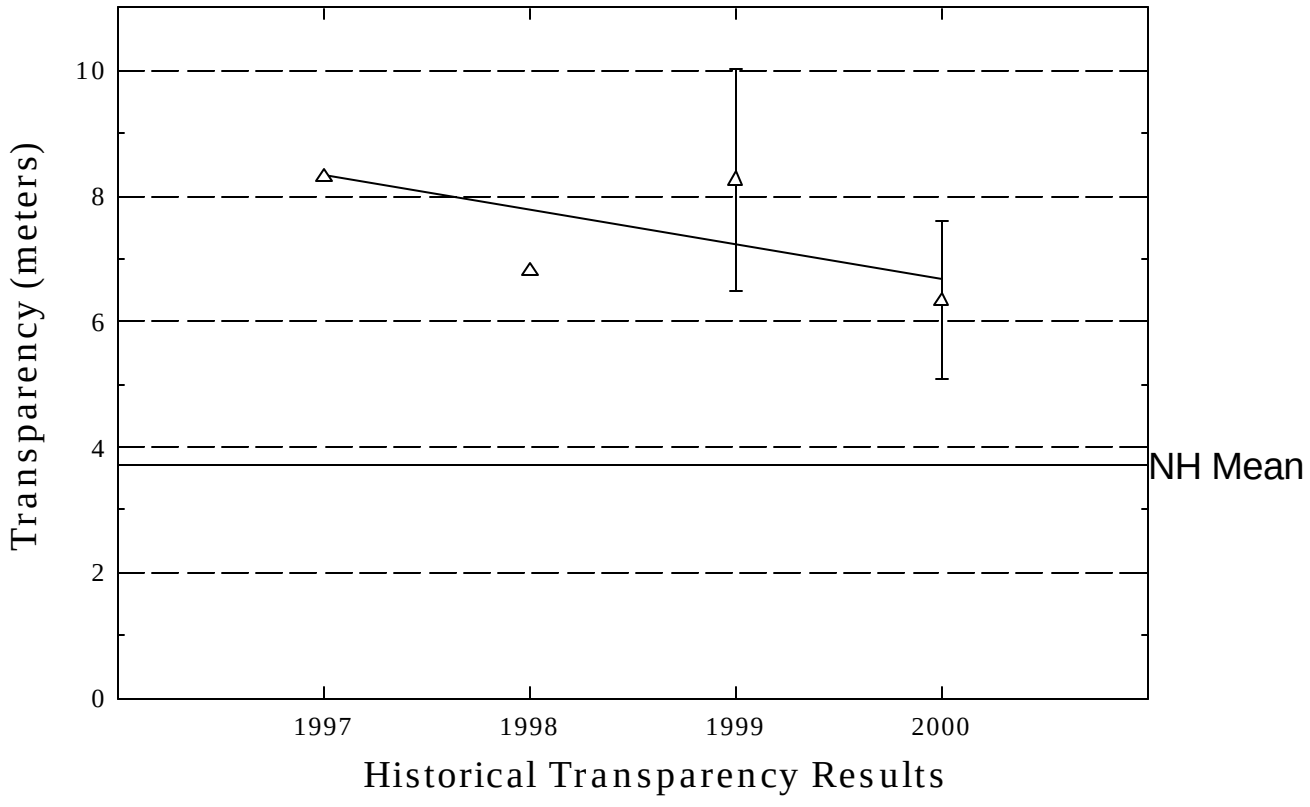


Historical Chlorophyll-a Results

Pleasant Lake, New London

Figure 2. Monthly and Historical Transparency Results





Pleasant Lake, New London

Figure 3. Monthly and Historical Total Phosphorus Data.

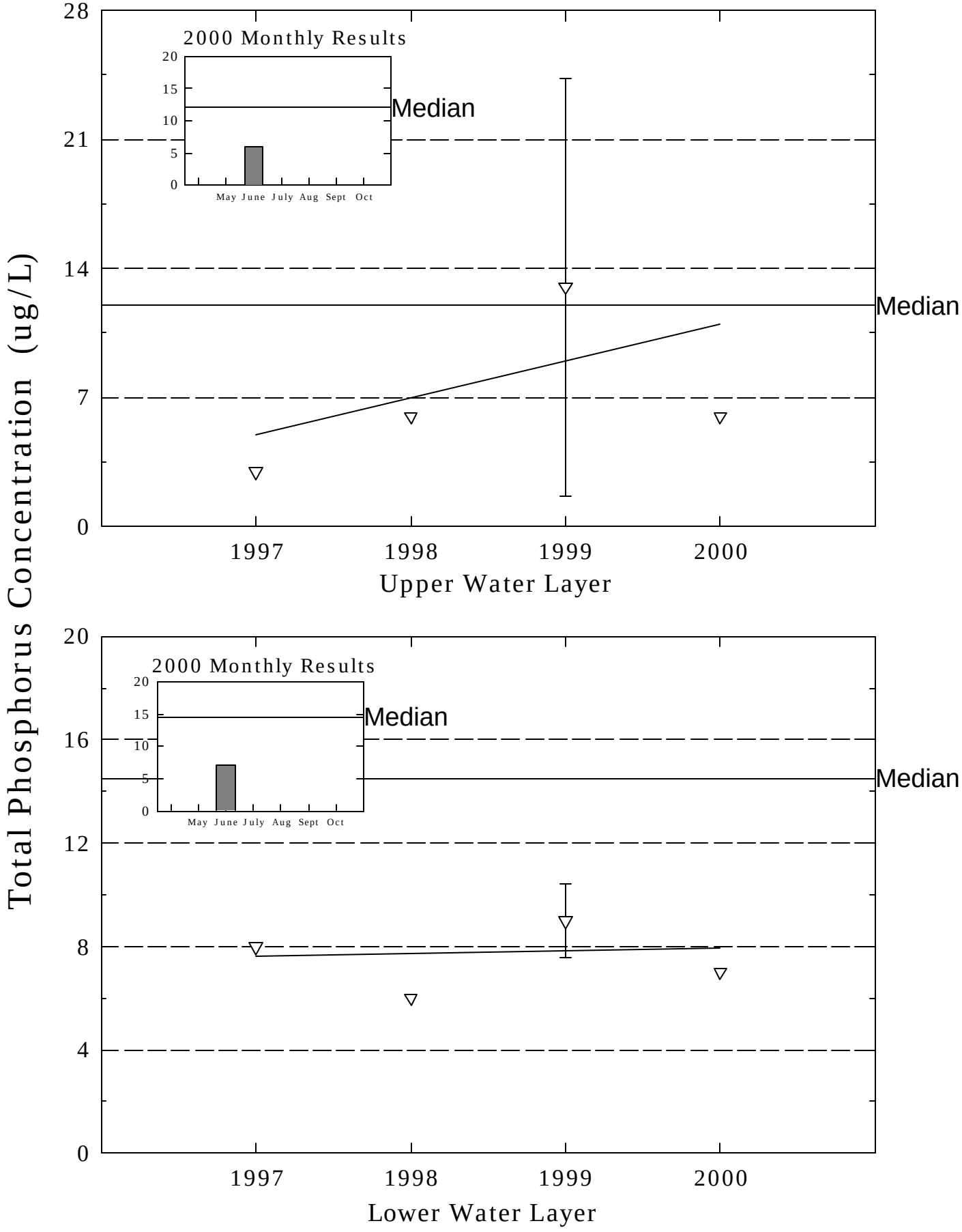


Table 1.

PLEASANT LAKE

NEW LONDON

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1997	1.44	1.44	1.44
1998	2.68	2.68	2.68
1999	1.25	1.25	1.25
2000	5.48	5.48	5.48

Table 2.

PLEASANT LAKE

NEW LONDON

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06/20/2000	ASTERIONELLA	63
	DINOBRYON	32
	UROGLENOPSIS	3

Table 3.

PLEASANT LAKE

NEW LONDON

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1997	8.3	8.3	8.3
1998	6.8	6.8	6.8
1999	7.0	9.5	8.2
2000	5.0	7.5	6.3

Table 4.

PLEASANT LAKE

NEW LONDON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	6.86	6.86	6.86
	1998	6.76	6.76	6.76
	1999	6.82	6.84	6.83
	2000	6.42	6.42	6.42
HYPOLIMNION				
	1997	5.99	5.99	5.99
	1998	6.37	6.37	6.37
	1999	6.42	6.43	6.42
	2000	6.28	6.28	6.28
METALIMNION				
	2000	6.39	6.39	6.39
PL 1				
	1996	6.67	6.77	6.72
	1997	6.57	6.97	6.80
	1998	6.66	6.85	6.77
	1999	6.81	7.03	6.90
	2000	6.60	6.97	6.73
PL 2				
	1996	6.68	6.87	6.76
	1997	6.34	6.83	6.60
	1998	6.52	6.84	6.65
	1999	6.60	6.90	6.77
	2000	6.32	6.87	6.57

Table 4.

PLEASANT LAKE

NEW LONDON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
PL 3				
	1996	6.70	6.79	6.74
	1998	6.65	6.65	6.65
	2000	6.44	6.87	6.66
PL 4				
	1996	6.83	6.83	6.83
	1997	6.04	6.82	6.39
	1998	6.32	6.32	6.32
	1999	6.63	6.95	6.76
	2000	6.46	6.83	6.66
PL 5				
	1996	6.75	6.75	6.75
	1997	5.78	6.64	6.14
	1998	5.98	6.52	6.17
	1999	6.16	6.75	6.44
	2000	5.80	6.68	6.30
PL 5A				
	1996	6.34	6.34	6.34
	1997	5.95	5.95	5.95
	1998	6.15	6.15	6.15
	1999	6.38	6.38	6.38
	2000	6.15	6.15	6.15

Table 4.

PLEASANT LAKE

NEW LONDON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
PL 6				
	1996	6.73	6.82	6.77
	1997	6.61	6.61	6.61
	1998	6.51	6.82	6.64
	1999	6.66	6.66	6.66
	2000	6.56	6.85	6.70
PL I				
	2000	6.82	6.82	6.82

Table 5.

PLEASANT LAKE

NEW LONDON

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1997	3.40	3.40	3.40
1998	4.10	4.10	4.10
1999	3.10	4.50	3.80
2000	4.70	4.70	4.70

Table 6.

PLEASANT LAKE
NEW LONDON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	40.2	40.2	40.2
	1998	42.9	42.9	42.9
	1999	46.7	47.1	46.9
	2000	46.8	46.8	46.8
HYPOLIMNION				
	1997	41.2	41.2	41.2
	1998	42.8	42.8	42.8
	1999	45.8	46.8	46.3
	2000	47.2	47.2	47.2
METALIMNION				
	2000	46.9	46.9	46.9
PL 1				
	1996	40.8	41.0	40.9
	1997	40.0	40.8	40.4
	1998	42.2	43.9	42.9
	1999	44.8	47.2	46.2
	2000	47.1	47.8	47.5
PL 2				
	1996	40.9	41.6	41.2
	1997	41.2	52.8	45.1
	1998	43.7	66.0	54.8
	1999	47.6	77.1	57.5
	2000	47.4	81.7	58.8

Table 6.

PLEASANT LAKE
NEW LONDON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
PL 3				
	1996	40.7	40.9	40.8
	1998	42.1	42.1	42.1
	2000	47.3	48.2	47.7
PL 4				
	1996	41.0	41.0	41.0
	1997	40.2	42.3	41.0
	1998	42.0	42.0	42.0
	1999	47.2	47.4	47.3
	2000	47.4	49.0	48.1
PL 5				
	1996	40.8	40.8	40.8
	1997	38.6	41.0	39.6
	1998	33.6	36.0	34.8
	1999	36.8	47.2	43.6
	2000	28.9	47.9	42.2
PL 5A				
	1996	24.0	24.0	24.0
	1997	23.0	23.0	23.0
	1998	28.1	28.1	28.1
	1999	29.3	29.3	29.3
	2000	25.6	25.6	25.6
PL 6				
	1996	40.7	40.9	40.8
	1997	39.3	39.3	39.3

Table 6.

PLEASANT LAKE
NEW LONDON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1998	42.2	42.8	42.5
	1999	44.7	44.7	44.7
	2000	46.8	49.5	47.7
PL I				
	2000	48.2	48.2	48.2

Table 8.

PLEASANT LAKE

NEW LONDON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	3	3	3
	1998	6	6	6
	1999	5	21	13
	2000	6	6	6
HYPOLIMNION				
	1997	8	8	8
	1998	6	6	6
	1999	8	10	9
	2000	7	7	7
METALIMNION				
	2000	7	7	7
PL 1				
	1996	3	5	4
	1997	3	7	4
	1998	1	44	13
	1999	3	6	4
	2000	3	9	5
PL 2				
	1996	4	7	5
	1997	7	7	7
	1998	6	22	14
	1999	4	27	12
	2000	2	21	8

Table 8.

PLEASANT LAKE

NEW LONDON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
PL 3				
	1996	4	9	6
	1998	13	13	13
	2000	< 5	8	5
PL 4				
	1996	3	3	3
	1997	3	20	11
	1998	3	3	3
	1999	3	5	4
	2000	4	9	6
PL 5				
	1996	3	3	3
	1997	6	8	7
	1998	8	19	13
	1999	7	18	13
	2000	4	7	5
PL 5A				
	1996	4	4	4
	1997	3	3	3
	1998	4	4	4
	1999	2	2	2
	2000	4	4	4
PL 6				
	1996	3	4	3
	1997	3	3	3

Table 8.

PLEASANT LAKE

NEW LONDON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1998	2	8	5
	1999	1	1	1
	2000	2	8	4
PL I				
	2000	2	2	2

Table 9.

PLEASANT LAKE

NEW LONDON

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		June 20, 2000	
0.1	19.3	10.9	118.2
1.0	19.2	10.9	118.3
2.0	19.1	10.8	116.4
3.0	19.0	10.6	114.5
4.0	18.5	10.6	113.0
5.0	17.2	10.6	110.3
6.0	15.8	10.8	109.2
7.0	12.6	11.4	107.0
8.0	11.2	11.4	103.4
9.0	10.2	11.5	102.0
10.0	8.8	11.2	96.8
11.0	8.1	11.3	95.9
12.0	7.7	11.0	92.3
13.0	7.3	10.4	86.7
14.0	7.2	10.2	84.1
15.0	7.0	10.2	83.9
16.0	6.9	10.2	83.4
17.0	6.8	10.1	82.7
18.0	6.8	9.6	79.0
19.0	6.7	9.5	78.0
20.0	6.7	9.4	76.6

Table 10.

PLEASANT LAKE

NEW LONDON

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 20, 2000	0.1	19.3	10.9	118.2
June 20, 2000	20.0	6.7	9.4	76.6

Table 11.

PLEASANT LAKE
NEW LONDON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
EPILIMNION				
	1997	0.6	0.6	0.6
	1998	1.0	1.0	1.0
	1999	0.7	0.7	0.7
	2000	0.2	0.2	0.2
HYPOLIMNION				
	1997	0.4	0.4	0.4
	1998	5.0	5.0	5.0
	1999	0.8	1.0	0.9
	2000	0.1	0.1	0.1
METALIMNION				
	2000	0.3	0.3	0.3
PL 1				
	1996	0.3	0.4	0.3
	1997	0.3	0.9	0.5
	1998	0.2	1.8	1.0
	1999	0.7	3.0	1.5
	2000	0.3	0.9	0.5
PL 2				
	1996	0.4	0.7	0.5
	1997	0.4	1.4	0.7
	1998	0.2	1.2	0.7
	1999	0.8	1.4	1.0
	2000	0.4	1.0	0.6
PL 3				
	1996	0.5	0.6	0.5

Table 11.

PLEASANT LAKE
NEW LONDON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
	1998	0.1	0.1	0.1
	2000	0.3	1.1	0.5
PL 4				
	1996	0.4	0.4	0.4
	1997	0.5	0.8	0.6
	1998	0.1	0.1	0.1
	1999	0.7	0.8	0.7
	2000	0.2	0.8	0.6
PL 5				
	1996	0.5	0.5	0.5
	1997	0.6	1.0	0.8
	1998	0.6	0.9	0.7
	1999	0.9	1.1	0.9
	2000	0.4	1.0	0.5
PL 5A				
	1996	0.3	0.3	0.3
	1997	0.1	0.1	0.1
	1998	0.6	0.6	0.6
	1999	2.0	2.0	2.0
	2000	0.6	0.6	0.6
PL 6				
	1996	0.3	0.4	0.3
	1997	0.4	0.4	0.4
	1998	0.1	2.0	1.0
	1999	3.0	3.0	3.0
	2000	0.2	2.0	0.7

Table 11.

PLEASANT LAKE
NEW LONDON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
PL I				
	2000	0.5	0.5	0.5

Table 12.

PLEASANT LAKE

NEW LONDON

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
PL 2		
	June 20	13
	July 24	0
	August 15	0
PL 4		
	June 20	1
	July 24	0
	August 15	11
	September 27	0
PL 5		
	June 20	2

NOTE: "<" means "less than" and ">" means "greater than"